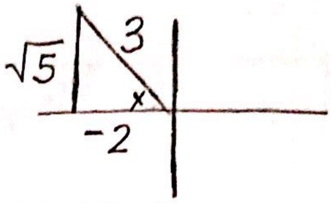
Name: ______________________________ Class Period: ________

Precalculus – Unit 2 Day 3

Double Angle Identities



Evaluate each expression given $\cos x = -\frac{2}{3}$ and $\frac{\pi}{2} < x < \pi$. You can use triangles.

1. $\sin 2x = 2\sin x \cos x$

$= 2\left(\frac{\sqrt{5}}{3}\right)\left(\frac{-2}{3}\right)$

$= \frac{-4\sqrt{5}}{9}$

2. $\cos 2x = 2\cos^2 x - 1 = 2(\cos x)^2 - 1$

$= 2\left(\frac{-2}{3}\right)^2 - 1$

$= \frac{-1}{9}$

Evaluate each expression given $\sin x = -\frac{3}{4}$ and $\frac{3\pi}{2} < x < 2\pi$. You can use triangles.

3. $\cos 2x = 1 - 2\sin^2 x = 1 - 2(\sin x)^2$

$= 1 - 2\left(\frac{-3}{4}\right)^2$

$= \frac{-1}{8}$

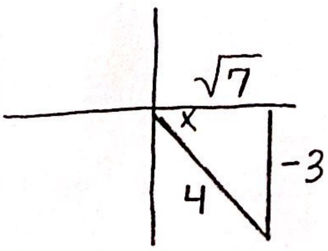
4. $\tan 2x = \frac{2\tan x}{1 - \tan^2 x} = \frac{2\tan x}{1 - (\tan x)^2}$

$= \frac{2\left(\frac{-3\sqrt{7}}{7}\right)}{1 - \left(\frac{-3\sqrt{7}}{7}\right)^2}$

$= \frac{\frac{-6\sqrt{7}}{7}}{1 - \frac{9}{7}}$

$= \frac{\frac{-6\sqrt{7}}{7}}{\frac{-2}{7}} = \frac{-6\sqrt{7}}{\cancel{7}} \cdot \frac{\cancel{7}}{-2} = \frac{-6\sqrt{7}}{-2} = 3\sqrt{7}$

$\frac{-3}{\sqrt{7}} = \frac{-3\sqrt{7}}{7}$



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Verify the identity.

5. $1-\cos 2x \sec^2 x = \tan^2 x$

$1-(2\cos^2 x-1)\sec^2 x = \tan^2 x$

$1-(2\cos^2 x \sec^2 x - \sec^2 x) = \tan^2 x$

$1-2\cancel{\cos^2 x}\left(\frac{1}{\cancel{\cos^2 x}}\right) + \sec^2 x = \tan^2 x$

$1-2+\sec^2 x = \tan^2 x$

$-1+\sec^2 x = \tan^2 x$

$-1+(\tan^2 x+1) = \tan^2 x$

$\tan^2 x = \tan^2 x$

6. $\sin 3x = 3\sin x - 4\sin^3 x$

$\sin(\underbrace{2x}_{\alpha}+\underbrace{x}_{\beta}) = 3\sin x - 4\sin^3 x$

$\sin 2x \cos x + \cos 2x \sin x = 3\sin x - 4\sin^3 x$

$(2\sin x\cos x)\cos x + (1-2\sin^2 x)\sin x = 3\sin x - 4\sin^3 x$

$2\sin x\cos^2 x + \sin x - 2\sin^3 x = 3\sin x - 4\sin^3 x$

$2\sin x(1-\sin^2 x) + \sin x - 2\sin^3 x = 3\sin x - 4\sin^3 x$

$2\sin x - 2\sin^3 x + \sin x - 2\sin^3 x = 3\sin x - 4\sin^3 x$

$3\sin x - 4\sin^3 x = 3\sin x - 4\sin^3 x$

Solve over the interval $[0,2\pi)$.

~~9.~~ $1-\cos 2x = \sin x$	~~10.~~ $2\cos x + \sin 2x = 0$